THE UNITED STATES' STRATEGIC INSECURITY-THE OIL NEXUS

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE
Homeland Security

by

JOHN A. GAGAN, MAJ, U.S.ARMY
B.S. Criminal Justice, East Carolina University, Greenville, North Carolina, 1997

Fort Leavenworth, Kansas
2010-01

REPORT DOCUMENTATION PAGE			*Form Approved* *OMB No. 0704-0188*
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**			
1. REPORT DATE *(DD-MM-YYYY)* 11-06-2010	**2. REPORT TYPE** Master's Thesis		**3. DATES COVERED** *(From - To)* AUG 2009 – JUN 2010
4. TITLE AND SUBTITLE The United States' Strategic Insecurity-The Oil Nexus			**5a. CONTRACT NUMBER**
			5b. GRANT NUMBER
			5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) MAJ John A. Gagan			**5d. PROJECT NUMBER**
			5e. TASK NUMBER
			5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Command and General Staff College ATTN: ATZL-SWD-GD Fort Leavenworth, KS 66027-2301			**8. PERFORMING ORG REPORT NUMBER**
			10. SPONSOR/MONITOR'S ACRONYM(S)
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.			
13. SUPPLEMENTARY NOTES			

14. ABSTRACT

There's not any doubt that oil is a finite resource and that the United States relies heavily on oil for homeland security, defense security, and economic security. Every facet of the American lifestyle is dependent on oil. The United States secured its status as a world Super Power around an industrial base driven by oil; accessible, cheap, and plentiful oil. The United States has enjoyed virtually unhampered access to oil for over one hundred years. However, in the first decade of the 21st Century, global demand for oil has accelerated at an unprecedented pace. As global supplies have become tighter, global competition for oil has increased. This study set out to answer the primary question of: "How does the United States' dependence on oil create national security vulnerability?" Secondary questions include: "Is America's dependence on oil a strategic vulnerability, what hazards are associated with America's dependence on oil, and how can the United States mitigate those hazards?

The findings of this study revealed that U.S. vulnerability to dependence on oil manifests in the realm of national homeland security, economic security, environmental security, and geo-political security, with economic security posing the greatest security vulnerability. Since the U.S. economy is driven by oil, it is a matter of national security that the U.S. maintains a safe, reliable, and ample supply of oil. As global competition increases for oil, securing those supplies will become more difficult, which leads to the most significant hazard associated with America's dependence on oil: energy supply disruptions.

15. SUBJECT TERMS

U.S. Dependency on oil

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. PHONE NUMBER** *(include area code)*
(U)	(U)	(U)	(U)	77	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

MASTER OF MILITARY ART AND SCIENCE
THESIS APPROVAL PAGE

Name of Candidate: Major John A. Gagan

Thesis Title: The United States' Strategic Insecurity-The Oil Nexus

Approved by:

______________________________________, Thesis Committee Chair
LTC Thomas R. Hoffman, Master's Degree

______________________________________, Member
Wendell C. King, Ph.D.

______________________________________, Member
Robert M. Brown, Master's Degree

Accepted this 11th day of June 2010 by:

______________________________________, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

ABSTRACT

THE UNITED STATES' STRATEGIC INSECURITY-THE OIL NEXUS, by MAJ John A. Gagan, 77 pages.

There's not any doubt that oil is a finite resource and that the United States relies heavily on oil for homeland security, defense security, and economic security. Every facet of the American lifestyle is dependent on oil. The United States secured its status as a world Super Power around an industrial base driven by oil; accessible, cheap, and plentiful oil. The United States has enjoyed virtually unhampered access to oil for over one hundred years. However, in the first decade of the 21st Century, global demand for oil has accelerated at an unprecedented pace. As global supplies have become tighter, global competition for oil has increased. This study set out to answer the primary question of: "How does the United States' dependence on oil create national security vulnerability?" Secondary questions include: "Is America's dependence on oil a strategic vulnerability, what hazards are associated with America's dependence on oil, and how can the United States mitigate those hazards?

The findings of this study revealed that U.S. vulnerability to dependence on oil manifests in the realm of national homeland security, economic security, environmental security, and geo-political security, with economic security posing the greatest security vulnerability. Since the U.S. economy is driven by oil, it is a matter of national security that the U.S. maintains a safe, reliable, and ample supply of oil. As global competition increases for oil, securing those supplies will become more difficult, which leads to the most significant hazard associated with America's dependence on oil: energy supply disruptions.

ACKNOWLEDGMENTS

I'd like to thank my family for their support, encouragement and sacrifice to help me complete this study and see it to the end. Additionally, I thank my committee members for their guidance, knowledge and professionalism in helping this study come to fruition. And finally, I'd like to thank the Army for providing this professional development opportunity to me.

TABLE OF CONTENTS

ACRONYMS

AESIS	Army Energy Security Implementation Strategy
CRM	Composite Risk Management
DOD	Department of Defense
NSS	National Security Strategy
OPEC	Oil Producing and Exporting Countries
U.S.	United States
USG	United States Government

CHAPTER 1

INTRODUCTION

> Competition for access to energy can become the life and death for many societies.
>
> —Mr. Henry Kissinger, Former Secretary of State

Energy is a commodity that has, until recently, been taken for granted in the United States (U.S.) as cheap, abundant, and readily available. But as the world population grows at an unprecedented rate, resource scarcity and access to energy sources will be a very real security challenge for the U.S. in the coming years. Already, a vast chasm exists between the world's haves and have-nots in regards to resource endowment and which global competition will only serve to exacerbate (Gautier 2008, 6). The U.S. has been placed in a precarious position in securing its future energy needs due to its dependence on imported oil. Additionally, global resource competition has already begun to reshape the world's geopolitical and economic landscape by the alignment of unlikely players to key energy producers, a phenomenon that has been likened by former Secretary of State Henry Kissinger, to the "Great Game" of the 19th Century. This realignment of oil wealth by state and non-state actors has the possibility of tipping the balance of global power.

The energy source that has recently been in the global spotlight and on the minds of Americans due to soaring prices is oil. There is no doubt that America is addicted to oil, and lots of it. Examining America's energy interests through the instruments of national power or Diplomatic, Information, Militarily, Economics, it becomes very

evident how interwoven oil is to strategic security and more specifically, U. S. vulnerability created by reliance on oil.

Diplomacy

To secure its energy needs, the U. S. must keep diplomatic relations open with key oil producing countries. This is problematic and creates conflicts of interest between developing foreign policy and securing energy requirements. A vast majority of imported oil comes from countries and regions with whom the U.S. maintains tenuous relations. Most of the proven oil reserves are located in the highly volatile and politically charged Middle East. Oil's leverage on foreign policy makes it hard for the U.S. to propagate democracy and influence non-democratic societies that have oil leverage. This affords extremist regimes a foothold and safe haven in those countries. Additionally, oil revenues from undemocratic regimes are used to counter U.S. efforts in building stable, democratic societies around the world. As global oil exploration expands, the U.S. is intensifying diplomatic efforts in regions of the world that have been plagued by corrupt governments and military regimes whose ruling elites are suspected of human rights violations, supporting terrorism, and plundering their nation's resource endowments using military power to suppress any form of democratic process or regime change. By U.S. alignment with governments and regimes that do not share the same ideology or diplomatic interests, the U.S. is hamstrung in developing foreign policies and partnerships that are not consistent with the U.S.' initiatives and goals (U.S. Senate 2006).

The world's oil resources race is taking on the appearance of the Cold War's arms race; the world becoming a chessboard whereby West and East are competing to gain a marked advantage in securing energy sources. A clear example would be in July 2008

when U. S. and Russian relations were strained when Russia invaded Georgia and seized key petroleum infrastructure in a show of force that sent a clear message that a U.S. backed western footprint was not welcome in the oil rich Caspian Sea region. Similarly, China has been vigorously pursuing interest in Africa, offering cash loans and development projects in exchange for oil exploration and interests in several African countries (Ghazvinian 2007, 276). The stakes are high and the U.S. has been forced to negotiate with unsavory characters to secure the energy it needs.

Information

America's vulnerability to foreign oil disruption is a well known fact and could easily be exploited by state and non-state adversaries. Using the Army's Composite Risk Management (CRM) model, four key hazards to U.S. dependence on foreign oil are revealed: Supply disruptions, global competition, terrorism, and the high cost all contribute to America's vulnerability to oil. As the world's largest consumer of crude, the U.S. must import large amounts of foreign oil, approximately 60 percent of its total consumption to function. This is a national security threat; more specifically an economic security threat.

Military

The U.S. military is heavily dependant on oil. The U.S. Department of Defense (DOD), an energy intensive organization, accounts for more than 1 percent of the annual U.S. oil consumption and is the largest single consumer of oil in the world. In 2008, DOD spent $20 billion dollars on energy; 75 percent of which was spent on tactical vehicles

and the remaining 23 percent on installations (Sohbet Karbuz, comment posted 6 April 2009).

The U.S. Air Force is the largest consumer of oil in the DOD, accounting for over 53 percent of the DOD's annual consumption, mostly in the form of jet fuel, followed by the Navy at 32 percent and the Army at 12 percent (Sohbet Karbuz, comment posted 2 July 2006).

The U.S. military's dependence on oil is a serious national security concern. The military has become vulnerable to global competition, supply disruptions, and military intervention that may hamper access to oil in the future. Although the Army contributes a relatively small portion to the DOD's annual oil consumption, its dynamic operating environments and critical capabilities are oil intensive and it is this dependence which makes it susceptible to tactical, operational, and strategic level security risks. Currently, the Army consumes over 1 billion gallons of fuel per year. This level of reliance on oil creates a myriad of problems for Army leaders. Army leaders must recognize oil dependence as a limiting factor in operations and develop mitigations at the tactical, operational, and strategic level of planning.

The U.S. Army is leading the way in the DOD to reduce its use of fossil fuels. It has created a comprehensive systems approach with supporting structure at appropriate levels to be effective. The rising cost of fuel and the amounts needed to sustain the Army in two operational theatres has raised concern and garnered energy security support from the Army's senior leadership. Taking the energy security initiative, on 26 September 2008, Secretary of the Army, the Honorable Pete Geren, approved the creation of the Army Senior Energy Council, tasked to mitigate vulnerability to oil dependence and

reduce the Army’s fossil fuel footprint. The council, co-chaired by General Chiarelli, Vice Chief of Staff of the Army and Keith Eastin, Assistant Secretary of the Army for Installations and Environment, has developed an energy strategy for use on installations, camps, combat systems, and weapons platforms. The Army Energy Implementation Strategy (AESIS) of January 2009, developed from the framework of the Army Energy Task Force, highlights the Army’s way forward to becoming less dependent on fossil fuels. The Army’s energy security vision is “An effective and innovative Army energy posture, which enhances and ensures mission success and quality of life for our Soldiers, Civilians, and their Families through Leadership, Partnership, and Ownership and also serves as a model for the nation.” The Army’s energy security mission is to “Make energy a consideration for all Army activities to reduce demand, increase efficiency, seek alternative sources and create a culture of energy accountability while sustaining or enhancing operational capabilities” (Department of the Army 2009).

The AESIS is a platform upon which the U.S. at large can emulate to reduce its dependence on oil. It provides a framework model from which the U.S. Government (USG) can build a comprehensive national energy security strategy. The AESIS has identified five strategic energy goals to reduce the Army’s dependence on fossil fuels: Reduced energy consumption, increased energy efficiency across platforms and facilities, increased use of renewable and alternative energy, assured access to sufficient energy supplies, and reduced adverse impact on the environment. The Army’s strategy promulgated at the national strategic level could serve to reduce America’s dependence on oil.

With national security at stake, it is imperative that DOD policy makers develop strategies that will reduce the military's reliance on oil. The technology exists to create combat systems that are more fuel efficient and just as lethal as legacy systems. Alternative fuels are under development that will bridge the gap to the force of the future.

The U.S. has deployed forces to provide security and stability to regions where oil is exported to America. The Middle East, the Caspian Sea region, and most recently, Africa are prime examples of military intervention in resource-rich regions. U.S. military presence prevents supply disruptions by protecting energy infrastructure and ensuring continued access to resources. The U.S. Geographic Combatant Commands are active in securing access to oil worldwide. Central Command's area of responsibility includes oil fields of the Middle East, the Southern Command includes responsibility for Colombia's Cano Limon pipeline, the European Command is training Georgians to protect the Baku-Tbilisi-Ceyhan pipeline, the Pacific Command patrols sea routes that oil tankers use in the Indian Ocean, South China Sea, and the Pacific, and the recently formed Africa Command's area of responsibility includes oil rich West Africa (Secureenergy.org 2010).

Economically

Crude oil and petroleum based products are crucial to the American way of life. Economically, oil is involved in every facet of not only the American financial system, but the global economy as well. Capitalism and free trade are driven by abundant, secure energy supplies. The manufacture of everything from food to weapons is tied to oil in some capacity. The fact that the industrial and agricultural segments of the U.S. are so intrinsically connected to oil is of great concern. Modern manufacturing and agriculture systems have evolved to maximize the use of energy intensive production processes that

are heavily dependent on oil. Energy supply disruptions in these industries would create repercussions that would resonate worldwide. As this study will reveal, oil supply disruptions of any magnitude trigger a negative economic response.

Background

Oil consumption rates have continued to rise sharply every year since 2000. As global demand and competition grows for access to finite reserves of crude oil, some very important strategic decisions must be made to secure the energy needed to sustain the U.S. now and in the future. More importantly, the national security is staked on having sufficient access to reserves of oil in order to drive the diplomatic, informational, military, and economic forces that protect vital interests domestically and abroad. A decrease in availability of oil, whether incrementally or suddenly, will have far reaching and long lasting negative consequences that could alter the American way of life and jeopardize the security of the U.S.

From 1865 until the mid-20th century, the U.S. was the world's largest producer and exporter of crude oil. Additionally, American companies owned and controlled oil commodities around the world. As a result, the U.S. heavily influenced how oil was traded, who it was traded to, and how much it would cost. This trend continued until the 1960s when domestic oil production began to wane, until by 1970, when the U.S. had achieved peak oil production; domestic production was not able to keep pace with domestic consumption. This event ushered in the era of reliance on foreign oil. The oil embargo crisis of 1973 showed, with crippling effects, how vulnerable the U.S. was to foreign oil. Under President Jimmy Carter's administration, the nation began moving in the right direction to free itself of foreign oil by creating the Department of Energy,

implementing conservation measures, and initiating the exploration of alternative fuel sources. However, by the 1980s, oil began flowing freely again under Oil Producing and Exporting Countries (OPEC), and the oil crisis of the 1970s became a distant unpleasant memory. Through the late 1980s and 1990s, oil was cheap and plentiful and it seemed that global supplies could sustain not only current levels of consumption, but exponentially increasing consumption rates, infinitely. However, in the early twenty first century as the global economy linked west and east, China and India's rapidly developing economies created a marked spike in global oil demand, causing significant price increases in the U.S. (Heinberg 2003, 37).

In 2008 global production of crude oil reached approximately 85 million barrels per day, up from 69 million barrels per day in 2000; world oil consumption in 2008 was 86 million barrels per day compared to 71 million barrels in 2000. (The discrepancy between oil produced to oil consumed is accounted for by a rather large amount of oil in transit at any given time.) From 2000 to 2006, global demand for oil grew over 1 percent annually, when in 2008 global demand peaked due to a global recession. It is important to note, global oil consumption has exceeded global oil production by over 1 percent annually from 2000 to 2006 (U.S. Energy Information Administration 2010). This trend is expected to continue as developing nations require more energy to sustain their growing industrial bases. The two most significant developing countries, China's (9 percent of global consumption) and India's (3 percent of global consumption) annual oil consumption rates are projected to grow annually at 7.5 percent and 5 percent respectively over the next twenty years (Institute for the Analysis of Global Security 2010).

Although to date there has never been an actual global oil resource-induced shortage, there are debates as to if and when global oil production will peak and begin an annual decline, just as domestic U.S. oil production did in 1970. This phenomena, known as peak oil theory was first introduced by M. King Hubbert, a senior research geophysicist with the Shell Corporation and the U.S. Geological Survey who, in 1959, predicted that peak U.S. oil production would occur between 1966 and 1971. (Domestic oil production actually peaked in 1970.) Several other prominent geologists and followers of Hubbert, using improved data and mathematical models, have predicted that at the current level of production global oil production will peak between 2010 and 2030. As far as the peak oil debate goes, there seem to be two diametrically opposed views on the subject. Although both sides agree that oil is a finite resource, two main opposing theories exist. On the one hand are the “Cassandras,” scientists and geophysicists that have calculated global peak oil production based on physics and mathematical models. On the other hand are critics of Hubbert’s theory, the “cornucopians,” economists, industry lobbyists, and even the U.S. Geological Survey and Department of Energy who have published “official” petroleum production estimates much more optimistic than Hubbert and his followers. The premise of the cornucopian’s arguments range from Peter Huber’s theory that the more energy a society consumes, the more energy they will have to find more energy, to Bjorn Lomborg’s theory that oil reserves are growing rather than becoming depleted, and that societies learn to become better at exploiting resources and that oil substitutes will be discovered when resources become scarce. No matter which theory is correct, the U.S. is faced with a situation of rising global oil demand and rising global competition for tighter oil supplies (Heinberg 2003, 115).

The U.S. is the largest consumer of oil in the world, accounting for 25 percent or 20.8 million barrels per day, of the total 80.3 million barrels of oil consumed around the world daily. In 2008, the U.S. imported 9.8 million barrels of oil a day, totaling 3.6 billion barrels for the year. In comparison, the U.S. only produced roughly 5 million barrels per day in 2008, less than one quarter of its daily consumption. The top three exporters of crude to the U.S. are: Canada at 1.9 million barrels a day, Saudi Arabia at 1.5 million barrels a day, and Mexico at 1.2 million barrels a day. Imports from OPEC topped 5.4 million barrels a day, with 2.3 million barrels coming from the Middle East. At current production rates, the world's "proven," 1.3 trillion barrel reserves, of which 83 percent will be controlled by Middle Eastern countries by 2020, would last 80 years, compared to 15 years of the non Arab producers which control 17 percent of the proven reserves (Institute for the Analysis of Global Security 2010).

Summary

In summary, there is no doubt that oil is a finite resource and that the U.S. relies heavily upon oil to function day-to-day. Every facet of the American lifestyle is driven by oil or some derivative of oil. In fact, the U.S.' status as a world super power was built around an industrial base driven by oil; cheap, accessible, and plentiful oil. The U.S. enjoyed this unrestricted access to oil for nearly one hundred years, until in 1970 domestic oil production peaked and the 1973 OPEC oil embargo highlighted U.S. vulnerability. These two events provided the first clear evidence of the vulnerabilities created by American dependence on oil, especially imported foreign oil. As the global economy has made the world smaller, competition for oil has gotten larger. The rapidly developing economies of other nations, namely China and India, are escalating the global

demand for oil at a pace that current production trends are unable to meet. As global supplies begin to diminish, global competition for oil will increase, possibly to the extent of armed conflict to secure those resources and in extreme cases, cause a shifting of the global balance of power. Currently, the U.S. consumes more oil that it ever has; approximately 20.8 million barrels a day, with consumption rates growing yearly. Consequently the U.S. imports more oil today than it ever has; approximately 9.8 million barrels a day. This reliance on foreign oil, combined with the increase in global demand and competition for oil, creates a strategic security risk for the U.S. and its interests. With this in mind, the U.S. must develop a comprehensive strategy to lessen its dependence on or free itself entirely from the dependence on not just foreign oil, but oil completely. This strategy would need to be implemented immediately to prepare the country for what many analysts consider will be the twilight for global oil production; a phenomena known as "peak oil," where global oil production will have reached its apex and begin a downward production trend yearly, projected to occur by the year 2030.

The purpose of this research is not to dwell on the doom and gloom of the lack of a feasible energy security strategy and what that means to the U.S.' future, but to identify risks associated with oil dependence and offer possible solutions to proactively avert the ramifications of not being prepared. The USG must develop and implement an energy strategy that will set achievable near, mid- and long-term goals to reduce reliance on fossil fuels, incorporating a paradigm shift away from costly, energy inefficient weapons platforms and systems to more sustainable ones. This theme must be carried forward throughout every step of the research, design, development, and procurement process. The U.S. Army has developed a comprehensive model to reduce oil consumption that

could be used as a national model until commercially viable alternatives can be fully fielded. The next four chapters evaluate the data, identify risks analysis information, and make conclusions and recommendations on the topic.

Thesis Question

The purpose of this thesis is to examine the strategic implications of the U.S.' dependence on fossil fuels and answers the question, "How does U.S. dependence on oil create national security vulnerability: what risks are associated with America's dependence on oil: and how can the U.S. mitigate those risks? This topic is extremely relevant given the context of the U.S. power projection, and global energy demand.

Assumptions

The study assumes that the U.S. and global oil demand will continue to grow annually, that no significant oil discoveries or production will occur in the near future, and that global competition will continue to increase. Additionally, that the next 25 years will be an era of persistent conflict marked by globalization, resource competition, weapons of mass destruction, hybrid threats, and failed states.

Limitations

This purpose of this study is to raise the awareness of its readers to the significant energy security challenges facing the U.S. It is a "one over the world" look at key aspects concerning U.S. energy security issues. This study is not intended to drill down into the technical, scientific realm of oil, nor to answer the peak oil theory, solve the U.S. trade deficit, or win the war on terror, but provides the reader a balanced overall analysis of the energy security problem and offer a few simple recommendations to mitigate the risks in

layman’s speak. The premise of the report is to offer the reader an overview of the strategic implications of America’s addiction to oil. The words fossil fuel, energy, and oil are used synonymously. The scope of this study will be limited to the energy data pertaining to the first decade of the 21st century, specifically the years 2000 to 2010, with most of the empirical oil production and consumption data coming from the year 2008.

CHAPTER 2

LITERATURE REVIEW

Introduction

The literature reviewed for this study centered on the questions of "What are the risks associated with America's dependence on oil, how can the U.S. mitigate the effects of oil dependency, and is there clear government policy on energy security?" The literature review consisted of examining books, articles, and online material concerning oil and energy security to determine the risks and implications of oil dependence. After the risks of oil dependence were established, the focus of the literature review concentrated on USG policy and publications, and DOD.

Source Review

There exists a plethora of material concerning the study of global energy consumption; where it comes from, who consumes it, and how it is consumed. However, there is not as much reference material on policies that detail specific courses of action to mitigate strategic risk to the U.S. concerning energy security now and in the future. Since 2000, the USG's DOD has made a concerted effort to study the effects of foreign oil dependence. The subject has received more attention since the record high oil prices of 2008, where oil traded at almost $150 per barrel, changing American's lifestyles. This prompted the U.S. to re-examine the current energy policy and search for ways to better diversify the current energy portfolio including: re-looking their current relationships with oil exporting countries, engaging in new relations with resource rich countries, developing better technologies to explore, survey and extract remaining oil from the

domestic fields, ushering tighter miles-per-gallon standards on domestic automakers to conserve oil, and hastening the development of alternative fuel sources. This report reviews literature from two main sources; academia and the government and will identify the informational gaps between current policy and what is lacking pertaining to securing future energy needs.

In the meantime, while weaning itself off volatile Middle Eastern and Venezuelan oil, the U.S. has several tangible options for extending the shelf life of its current fossil fuel infrastructure. These options include conservation, a moderate shift to other fossil fuels including coal and natural gas, increasing domestic exploration and production, importing oil from other producers such as Africa and the Caspian Sea region, and developing further shale oil and tar sands refining technologies.

While the U.S.' dependence on oil portrays a bleak long term outlook, there are several viable non-fossil fuel alternatives to oil based architecture on the horizon. Technologies that are currently under development include safer nuclear power, harnessing wind energy, collecting solar power, hydrogen technology, more efficient hydroelectricity, geothermal power, tidal energy, bio mass fuels, and free energy devices.

In theory, the shift from a fossil fuel driven to a greener, renewable energy based society is achievable. Commercial industry and investors have already demonstrated great strides in the way ahead, in alternative energy by developing renewable technologies such as hybrid vehicles, solar and wind powered generators, and bio fuels. Across the board, however, the U.S. government is lagging behind the next generation of energy solutions, especially in planning for energy security.

Comprehensive information exists concerning the study of energy and fossil fuel consumption. Much of the material in circulation seems to have been written during times of impending energy crises; during the late 1970s, early 1980s, and mid 2000s. Many books, professional journals, and studies were published by scientists, geophysicists, and economists on every facet of the life cycle of oil and the ramifications of oil dependency. In his 2003 book, *The Party's Over*, Richard Heinberg chronicles oil, war, and the fate of industrial societies in the twilight of global peak oil. Heinberg illustrates the connectivity of oil as it relates to food systems, financial and business systems, the industrial complex, population and immigration, transportation and foreign policy. Additionally, he shows examples how oil, politics, and wars are interconnected and how future resource competition, conflict, and crisis are imminent. The prospects of not having ample supplies of oil are sobering, especially as seen through the security perspective.

Not long ago, the debate of peak oil theory was of concern only to those in the oil industry; the average American did not know about it and probably did not care. However, as Hurricane Katrina caused oil supply disruptions in 2005, energy security has taken center stage in American policy and has reinvigorated experts to relook the issue. The book, *Hubbert's Peak* written by Kenneth Deffeyes, Professor Emeritus at Princeton University, was a colleague of M. King Hubbert and in 2001 warned of the impending world oil shortage. In scientific fashion, Deffeyes describes the origins of oil, techniques of finding oil, methods to recover oil, discoverability of oil fields, rate plots, and the future of fossil fuels. Again, the outlook is bleak in terms of global oil production in the not so distant future.

Most of the work published from the mid-2000s recognizes and is in agreement that oil is a finite resource that will eventually run out and that its dependence carries significant implications to the American way of life. Additionally, the impact on the climate from burning fossil fuels has caused heated debate on climate change and global warming. In her 2008 book, *Oil, Water and Climate: An Introduction,* Catherine Gautier, the former Director and Principle Investigator at the Institute of Computational Earth System Science and current head of the Earth Space Research Group at the University of California, Santa Barbara, illustrates the linkages between oil, water and climate change, and security.

After analyzing official government policies concerning oil security and alternative energy development, it becomes very evident that there is no real plan. Across the departments from the Department of Energy to the DOD, a huge disconnect exists between the various governmental agencies as to a comprehensive strategy to reduce America's reliance and vulnerability on foreign oil. A major component of the security strategy that is missing in the analysis is a clear strategy on how the DOD will reduce its dependence on oil now and in the future. Several studies have been conducted to assess the military's way ahead on this issue, with no clear, discernable course of action. In his 2007 U.S. Army War College monograph, entitled "U.S. Oil Dependency-The New Weapon of Mass Disruption," Lieutenant Colonel Joseph E. Czarnik chronicles the link between U.S. oil dependency and vulnerability and oil demand as a strategic weapon. More importantly, the report highlights the fact that the U.S. does not have a national energy crisis response plan or strategy to manage short term energy disruption scenarios.

Recently, the USG has made a concerted effort to study the effects of fossil fuel dependency and ways to mitigate those effects. This has prompted the U.S. to re-examine current energy usage policies and the search for ways to better diversify its energy portfolio by implementing conservation initiatives, developing better technologies, and exploring alternative energy sources.

This literature review will chronologically analyze the most influential USG publications concerning fossil fuel dependency and energy conservation strategies, including the 2001 *Defense Science Board* Reports, 2002 U.S. *National Security Strategy* (*NSS*), 2006 U.S. *NSS*, 2006 *JASON* report, 2008 U.S. *National Defense Strategy*, 2009 *Army Energy Security Implementation Strategy* (*AESIS*), and the *2010 Quadrennial Defense Review*.

The 2002 *NSS* addresses energy security challenges of the future from a global economic standpoint. The 2002 *NSS* takes a languid approach concerning energy security issues, merely hinting at the need for energy access to fuel the global economy. The following paragraph from the 2002 *NSS* denotes the only mention of energy security throughout the entire document. “We will strengthen our own energy security and the shared prosperity of the global economy by working with our allies, trading partners and energy producers to expand the sources and types of global energy supplied, especially in the Western hemisphere, Africa, Central Asia, and the Caspian region. We will also work with our partners to develop cleaner and more energy efficient technologies.” In 2006, the tone of the message is more urgent concerning oil and energy security issues. In stark contrast, the 2006 *NSS* details an ambitious energy security strategy not only for the U.S., but for international partners in the development of alternate energy sources including the

Global Nuclear Energy Partnership, clean coal development, and hydrogen (The White House 2006, 28). Interestingly, the 2002 and 2006 *NSS* addresses the national security threat of reliance on foreign oil by "diversifying global sources of energy" of which, Africa and South and Central Asia, are made mention. More alarming is that the 2006 *NSS* recognizes China as a U.S. threat to global energy resource security as evidenced by the following quotes: "acting if they can somehow lockup energy supplies around the world . . . and supporting resource rich countries without regard to the misrule at home or the misbehavior abroad of those regimes" (The White House 2006, 40). The 2006, DOD commissioned *JASON* report entitled "Reducing DOD's Fossil-Fuel Dependence" was charged with assessing pathways to reduce DOD's dependence on fossil fuel, due to increasing dependence of foreign oil, as well as the rising fuel cost for U.S and DOD. Additionally, they were to assess the U.S. and DOD implications associated with dependence and cost of imported oil. Two of the *JASON* report problem statements tie directly into this report; "Is there a future shortage in oil to the DOD?" and "What are the national security and national defense implications of the global and domestic oil supply and demand picture?" The findings indicated that there would be no DOD fuel shortages in the next 25 years and that imported oil posed no significant immediate security threat, only an economic threat to the U.S. The report however, was based on the fact no significant global supply shortages or upheavals due to political or other situations in key oil producing regions that supply the U.S., most notably the Middle East, Venezuela, and Russia would occur, nor were disruptions in crude oil feedstock routes or transportation corridors likely to occur in the next 25 years. Additionally, given that the DOD's low percentage of the U.S.' oil consumption (approximately 1 percent), that domestic

production could account for foreign oil disruption difference, and that a 12 percent U.S. oil consumption reduction could eliminate the need for all of imported Middle Eastern oil and the vulnerabilities and volatility associated with it if need be. The report did not elaborate how an energy upheaval would affect U.S. national security in the aggregate.

The 2008 *National Defense Strategy* recognizes the future resource challenges to energy security. It illustrates the linkage of growing global competition for those energy resources to the health of the global economy, the changing geopolitical landscape, climate change, and the "increasing reliance on petroleum products from areas of instability in the coming years, not reduced reliance." Further, the DOD lists "examining its own energy demands and taking action to reduce fuel demand where it will not negatively affect operational capability" as a priority (Department of Defense 2008, 16).

The *2010 Quadrennial Defense Review* is probably the most well rounded product produced by the government detailing a straight forward strategy to approaching energy security. The DOD translates the challenges to global and thus U.S. security through the linkages of the paradoxical trinity between energy security, climate change, and economic stability, that rising competition for resources may cause. DOD defines energy security as "having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet operational demands." DOD understands they "must incorporate geostrategic and operational energy considerations into force planning and requirements development in future operations." The *Quadrennial Defense Review* contains near term goals and workable solutions to bridge the gap from fossil fuel dependence to fossil fuel independence. Among the sustainable solutions to energy independence on installations and Forward Operating Bases is the exploitation of

renewable alternative energy sources including wind, solar, geothermal, and biomass. Similarly, alternative energy sources to power the military's non-tactical vehicles are being developed and tested including hybrid power, electricity, hydrogen, and compressed natural gas.

In 2000, the Secretary of Defense directed the Defense Science Board to form a task force to study fuel efficiency improvements of weapons platforms due to rising prices of oil. In essence, the DOD acknowledged that the aging fleet of weapons systems were fuel inefficient and wanted to study the issue of energy consumption. This was the first attempt made by the DOD to address the fact that foreign oil and energy as a whole may be a limiting factor on future battlefields. The *Defense Science Board* 2001 report found five impediments to fuel efficient combat systems: (1) fuel efficiency benefits are not valued or emphasized in DOD requirement or acquisition process; (2) DOD prices fuel on wholesale refinery price and does not include the cost of delivery to the customer; (3) DOD does not reward efficiency or penalize inefficiency; (4) operational and logistics wargaming of fuel requirements is not cross linked to the service requirements development or acquisition process; and (5) high payoff, fuel efficient technologies are available now to improve warfighting effectiveness in current weapon systems through retrofit and in new systems acquisition. The 2008 *Defense Science Board* report, "More Fight, Less Fuel", found that a primary energy challenge was unnecessarily high and growing battlespace fuel demand that compromises operational capability and mission success, requires an extensive support force structure at the expense of operational forces, creates more risk for support operations than necessary, and increases life cycle operations and support costs. Additionally, the report listed six findings: (1) that the

recommendations of the 2001 *Defense Science Board* report had not been implemented; (2) critical national security and homeland defense missions are at an unacceptably high risk of extended outages from a failure of the electric power grid; (3) DOD lacks strategy, policy, metrics, informational and governance structure to properly manage its energy risks; (4) that technology is available now to make DOD systems more energy efficient; (5) many opportunities exist to reduce energy demand by changing wasteful operational policies and procedures; and (6) an operational risk from fuel disruption requires demand side remedies.

The 2009 *Army Energy Security Implementation Strategy* (*AESIS*) mentioned in chapter 1, contains a strategy for reducing the Army's dependence on fossil fuel. In it, were listed five energy security goals: (1) Reduce energy consumption, (2) increased energy efficiency across platform and facilities, (3) increased use of renewable and alternative energy, (4) assured access to sufficient energy supplies, and (5) reduced adverse impact on the environment. The Army has done an excellent job at increasing energy efficiency at fixed garrison facilities through conservation efforts, energy and resource efficient buildings, and use of alternative energy sources. However, tactically, the Army is lacking in reducing its oil consumption footprint. Energy intensive legacy systems and inefficient weapon platforms are still used on the modern battlefield. Most Forward Operating Bases are completely dependent on diesel generators to supply power needed to sustain life support operations. Although the AESIS identified the goals that need to be remedied, they are still goals with no road map on how to get there from here.

Summary

Most of the scientific and academia community has conceded, from analysis and modeling, that world oil production has or is very close (within two decades) to achieving peak oil. It is a concept that the government should be dealing with now; at the very least, developing concise policy on how to reduce its impact. Instead, it is easy to establish the fact that there is no clear unity of effort across USG departments for developing and implementing a clear strategy on achieving energy, especially oil security. Even throughout the DOD, there exists no common foundation or framework on which to build an actionable plan.

What is needed is a “nested” strategy supported by policy that connects and synchronizes individual governmental entities,’ ideas, and efforts into a plan of action.

CHAPTER 3

METHODOLOGY

Introduction

The primary purpose of this study was to answer the question, “What are the strategic risks associated with America’s dependence on oil? After analysis, the most dangerous and most probable risk of oil dependence to the U.S. is assured access to sufficient oil supplies.

The methodology used to support research for this report involved inductive and deductive logic to analyze and evaluate both qualitative and quantitative data. The relevancy and value in this type of research methodology lies in the fact that much research and analysis has already been accomplished and compiled by many governmental and independent sources on the topic of fossil fuel dependency and strategic implications and vulnerabilities of U.S. reliance on oil. This study links the two together by examining the importance of oil to the U.S., the future of oil as an energy source, and the implications of reliance on foreign oil. The first step in the research process centered on determining the importance of oil to the U.S. Next, analyzing peak oil theory to determine if it was relevant in assessing risk to the U.S. and to establish oil as being viable in the future. Finally, to determine the U.S. risk associated with the dependence on foreign oil. The Army’s CRM model was used as a logical vehicle in defining and determining strategic risks to the U.S. concerning oil dependence.

The purpose of chapter 3 is to describe the methodology employed to develop the linkages for risk analysis between U.S. dependence on oil and the security implications to the U.S. thereof. The methodology model selected for this study is based on the U.S.

Army's CRM model. The information analyzed for the study was broken down into two main subject matter areas. The first literature reviewed pertained to oil analysis; where it comes from, how it is used, outlook for future reserves, peak oil theory, and alternatives to oil. The second area of literature review centered on official U.S. policy concerning energy security from a strategic standpoint. The analysis of which forms the basis of the argument that U.S. dependence on foreign oil truly does pose national security risks.

The Army defines risk as a level expressed in terms of hazard probability and severity of consequences, with risk equaling the probability of an event multiplied by the cost of that same event. That same principle has been applied to this study and provides a logical format and sequence to the report. The U.S. Army's CRM model consists of a five step process that assists in developing controls to mitigate risk of defined potential hazards in the operational environment to facilitate mission accomplishment. Its applicability to this study nests with identifying U.S. risks and vulnerability to foreign oil and the overall strategy to reduce those risks. The five steps of the CRM model and how they nest with this study are listed below.

Composite Risk Management Model

Step 1: Identify Hazards

The Army defines a hazard as "A condition with the potential to cause injury, illness or death of personnel; damage to or loss of equipment or property or mission degradation. A hazard may also be a situation or event that can result in degradation of capabilities or mission failure." The Army's definition of hazards can be easily translated and incorporated into this study concerning the hazards and risks associated with U.S. energy vulnerability. For identifying hazards within the context of the study, the Army's

assessment factors of Activity, Disrupters, Terrain and Weather, People, Time, and Legal and Civil are considered.

Step 2: Assess Hazards

Assessing hazards links the probability of a particular hazard occurring and the degree to which it will adversely affect an organization, mission, or people. There are three sub-steps related to assessing the hazards. The first step is to assess the probability of the event or occurrence, the second step is to estimate the expected result or severity of an occurrence, and the third step is to determine the specified level of risk for a given probability. The two main components of assessing a risk are probability and severity. Probability is based on the frequency or likelihood of an event occurring. The CRM uses five levels of probability: frequently, likely, occasional, seldom, and unlikely. Frequently describes hazards that occur very often and are expected to happen. Likely identifies a hazard that can occur several times and is common. Occasional describes a hazard that can occur sporadically, but is usually uncommon. Seldom means a hazard is remotely possible, but could occur. And unlikely means that a hazard can be assumed it won’t occur, but is not impossible.

Similarly, there are varying degrees with which the CRM gauges the severity of a hazard that could occur. Severity describes the degree of damage or negative effect a hazard will have. The CRM identifies four degrees of severity. The first and most severe is catastrophic. Catastrophic severity describes an occurrence that results in complete mission failure or the loss of the ability to accomplish a mission, a mission–critical security failure and severe environmental damage. Critical severity describes a risk that severely degrades mission capability, significant environmental damage, and security

failure. Marginal severity is characterized by a degraded mission capability and minor damage to the environment. Negligible severity has little or no adverse impact on mission or environment.

The Army determines the level of risk for an operation or mission by evaluating the risk based on probability and severity using the standard risk assessment matrix. The matrix is a table that lists probability across the top and severity down the side. To determine the level of risk for an operation, the commander determines the probability and cross references it with the severity of an occurrence. Where the two intersect on the matrix is the initial level of risk.

Levels of risk are classified into four categories of severity: Extremely high, high, moderate, and low. Extremely high risk is characterized by a frequent or likely probability of catastrophic loss. The mission cannot be completed if hazard occurs during operation. The risk associated with the mission, activity, or event may have severe consequences beyond that event. High risk is defined by the occasional or seldom probability with catastrophic loss. The mission will sustain significant degradation with serious consequences if the hazard occurs during an operation. Moderate risk is determined as unlikely probability with a catastrophic loss. The mission will suffer degradation and reduced capability. Low risk describes unlikely probability with a critical loss. The mission should suffer very little to no degraded capability or degradation.

Step 3: Develop Controls and Make Decisions

Controls are used to mitigate risks and reduce the hazards identified in step 2 of the process. There are three basic categories of controls: Education or awareness controls, physical controls, and elimination controls. Education controls includes an organization's

knowledge that a hazard exists and identifies ways to mitigate the risk. Physical controls are concerned with the development of barriers and guards to prevent hazards from disrupting an organization. And elimination controls seeks to remove or avoid the hazard all together. The controls in this study consist of the ways to mitigate the security threats and make decisions on implementation of strategies to bridge the gap to sustainable energy independence.

Step 4: Implement Controls

Implementing controls means conveying the developed controls through clear and simple plans and strategies at the appropriate levels. For this study, implementing controls contains clear, achievable recommendations of goals to mitigate the risk of the identified hazards to U.S. national security.

Step 5: Evaluate and Supervise

Evaluation and supervision are the two most important components of the CRM model. The correctly identified hazards mitigated with the best implemented controls are useless if these components are not completed. Evaluation is concerned with measures of effectiveness and measure of performance with indicators, ensuring the right controls are being implemented. This step outlines recommended benchmarks and metrics to determine the effectiveness of the controls to mitigate the assessed risks.

The methodology developed to conduct this study was modeled after the Army's CRM program. It provided a methodical, step by step process to assess and mitigate risks associated with U.S. vulnerability to oil dependency. The CRM model will provide the framework to logically analyze the data. The identified hazards were selected based on

the assessed threat they posed to U.S. security. Each of the four risks listed above are real world scenarios that are occurring now and could have serious consequence for national security in the very near future.

CRM Model Framework to Analyze Data

Step 1: Identify Hazards

It is already well known that America is addicted to oil. As the largest consumers of oil in the world, the entire infrastructure of American society is totally dependent on oil. When identifying hazards associated with such a dependence on oil, the logical place to start is impediments to access of oil. In examining impediments to access of oil through the Army’s hazard assessment factors of Activity, Disrupters, Terrain, Weather, People, Time, and Legal and Civil considerations, four significant hazards quickly come to mind: energy supply disruptions, the link between terrorism and foreign oil, global competition for oil, and the cost of foreign oil.

First, energy supply disruptions are a very real threat to U.S. security, from both foreign and domestic perspectives. As mentioned in chapter 1, the oil embargo crisis of 1973, a politically generated supply disruption, showed how vulnerable the U.S. was to foreign oil by temporarily crippling the U.S. economy. A little closer to home in 2005, Hurricane Katrina disrupted oil production and refinery operations on the Gulf Coast so severely that refined product supplies dwindled to record lows and prices sky rocketed. Some analysts believe Katrina illustrated the crux of the peak oil phenomena, where supplies were so tight that the disruption of this magnitude had devastating effects and ushered in the era of public awareness of energy supply and demand principles. An oil supply disruption of any proportion would have dire consequences for the U.S. As

mentioned in chapter 1, U.S. existence is intricately intertwined with access to cheap abundant oil. U.S instruments of national power, diplomatic, military, and economic lines of effort are literally dependent on foreign oil.

There is clear evidence that shows the link of petro dollars funded terrorism. It's a paradox that the U.S. is buying oil from states that support terrorism, only to use that oil to fight terrorism.

Global demand for oil is rising and the U.S. has been thrust into relations with unsavory state and non-state actors for those resources. Moreover, the U.S. is in direct competition with China for access to oil rich regions around the world. China has launched an aggressive campaign to "lock up" sources of energy around the globe.

Foreign oil is expensive. In 2008, the U.S. spent nearly $354 billion dollars on imported oil (suite101.com). With the U.S. deficit well over a trillion dollars, supplying the military with fossil fuels in the future could severely strain the U.S. budget and possibly cause reduced funding in other areas to provide fuel for the military force.

Step 2: Assess Hazards

Each of these hazards was evaluated on their probability and severity of occurrence and given an initial risk assessment. The hazards were then evaluated using the risk assessment matrix. The following are the results and initial risk associated with the hazards.

The first hazard that was evaluated was energy supply disruptions. Evaluated vulnerabilities to energy supply disruptions were: oil production infrastructure, natural disasters, oil terrorism, and politics. Oil production infrastructure is of concern; however most of the facilities are maintained and upgraded to compensate for their age. Even

when refineries are shut down for maintenance, there is a less than 5 percent production lost. However, due to the limited numbers of facilities, especially with only 142 operational refineries, even one off production could negatively affect refined products inventory. The probability of oil production infrastructure becoming non-operational due to mechanical issues is low; however, if a significant proportion went down due to maintenance, the severity would be critical. When evaluated using the risk assessment matrix, initial risk is determined to be Moderate.

Natural disasters, especially hurricanes are common phenomena in the Gulf Coast region of the U.S. where most of the domestic oil is produced and refined. The probability of a natural disaster such as Hurricane Katrina destroying oil production in the Gulf is likely with the severity of a hurricane, critical. When evaluated using the risk assessment matrix, the initial risk is high.

Both foreign and domestic terrorism is a very real threat today. Al Qaeda knows that oil is the “artery of the Crusader nation” (Osama Bin Laden) and will eventually exploit this vulnerability. Although there have been no significant terrorist attacks on oil production infrastructure in the 21st century, it would be a high value target. The probability of this occurring is low, but the severity would be catastrophic. When evaluated using the risk assessment matrix, the initial risk is high.

As global oil supplies become tight, oil producing countries can use oil as a weapon to leverage against the U.S. Political conflicts amongst oil producing countries and the U.S. could result in embargos and much higher oil prices. A prime example would be the 1973 OPEC oil embargo where OPEC cut export to the U.S. for its support to Israel. Oil could very easily become the weapon of choice to bring the U.S. to its knees

without ever firing a bullet. Because the global economy is so interconnected, it would be hard for an oil producing nation that is dependent on oil exports to cut exports to the U.S. However, with China and India's industrial powered economies thirsty for oil, they could easily make up the U.S. difference in imports. The probability of this happening is unlikely, but with the U.S. importing 60 percent of its oil consumed, it would be catastrophic. When evaluated using the risk assessment matrix, the initial risk is high. Since this hazard encompasses a broad range of plausible risks to oil supply interruptions, this study finds energy supply disruptions to be the most dangerous and probable hazard to U.S. energy security.

The second hazard evaluated was the link between terrorism and foreign oil. Although there have been murders and kidnappings of oil workers in Nigeria, as mentioned earlier, in the 21st Century, there has not been a successful significant terrorist act against oil infrastructure: wells, oil drilling rigs, storage facilities, nor refineries. However, it is plausible that Al Qaeda could plan attacks in Saudi Arabia, the world's largest oil producer, with the world's largest proven oil reserves and the world's largest oil field that pumps oil directly and exclusively into the world's largest storage facility, to disrupt worldwide oil supplies. This probability assessment is subjectively upgraded to likely because the intent from terrorist organizations is present for an attack. Experts estimate that one 9/11 style aircraft attack on the Ras Tunura oil complex where 80 percent of Saudi oil is stored, would render it non-operational for years and would be economically devastating globally. The severity assessment would be catastrophic. When evaluated using the risk assessment matrix, the initial risk is extremely high.

The third evaluated hazard is global oil competition. Although the U.S. is the largest consumer of oil in the world, accounting for 25 percent of global production, China and India are catching up fast. China has accounted for one-third of global oil consumption increase in the last three years. The International Energy Agency estimates that global oil consumption by 2030, the year that "Cassandras" estimate global oil peak, will rise to 106 million barrels of oil per day, an average growth of 1 percent annually, while production in existing oil fields declines at a rate of 8.6 percent from 6.7 percent. As supplies and access to oil become scarce, tensions will rise. China has embarked upon a global quest for energy sources in an effort to secure them. Global demand will drive higher global competition and could raise the cost of oil even higher. The probability of global competition is likely; the severity is critical. The initial risk to the U.S. is high.

The fourth evaluated hazard is the cost of oil. As mentioned above, global oil demand drives global oil competition, which drives oil prices higher. It is a classic example of supply and demand. International Energy Agency experts say that the price of a barrel of oil could exceed $200 by 2030. The U.S. spent nearly $354 billion dollars on imported oil in 2008. Although that was a small portion of the deficit, what will happen when oil trades for $200 or $300 per barrel?

Step 3: Develop Controls and Make Decisions

As mentioned above, there are three types of controls listed in the CRM: education, physical controls, and elimination controls. All three types of controls can be used in mitigating the four hazards identified energy supply disruptions, the link between terrorism and foreign oil, global competition, and the high cost of oil.

Implementing Controls

Once controls have been developed they must then be implemented. In this case the implementation of controls would be through clear, actionable polices at the national level. What the U.S. needs is a synchronized, unified strategy with clearly articulated measures of effectiveness, measures of performance, and benchmarks along the way, all of which seem to be absent from current policy.

CHAPTER 4

STRATEGIC ANALYSIS

Hazards to Oil Access

Chapter 3 identified energy supply disruptions as the most dangerous and probable hazard to U.S. national security. Since it is nearly impossible to accurately validate true “proven” world oil reserves or to predict future technologies that will be leveraged to access previously unrecoverable oil, the debate over peak oil theory and whether or not the world is running out of oil will continue to rage on for decades. In the present, strategic level planners must be cognizant of challenges concerning access to sufficient quantities of oil. Significant challenges to oil access include oil supply disruptions, global competition for oil, terrorism fueled by foreign oil revenue, and the exorbitant cost of imported foreign oil and fiscal ramifications thereof.

Energy supply disruptions are the greatest hazard to U.S. oil dependency. The greatest risk associated with this hazard is degraded economic security and stability. This assertion is supported by the first sentence contained in the abstract of a 2009 Rand Corporation study by the Infrastructure, Safety and Environment and National Security Division; “The major risk to the U.S. posed by reliance on oil is the economic costs of a disruption in global supplies.” (Rand, 2009)

The 2009 Rand Corporation study, “Imported Oil and U.S. National Security,” supported by the Institute for 21st Century Energy, which is affiliated with the U.S. Chamber of Commerce, was conducted to “evaluate the risks to national security associated with U.S. imports of oil.” The study evaluated five vulnerabilities to U.S. oil dependence: (1) “The economic impact due to a precipitous drop in global oil supply, (2)

oil producing countries export manipulations to influence the U.S. and its allies, (3) the role of oil exporting earnings in support of terrorism and (5) the costs of protecting supply and transit of oil from the Persian Gulf." The Rand findings concluded: (1) " An abrupt and extended fall in the global oil supply and the resulting higher prices would seriously disrupt U.S. economic activity, no matter how much or how little the U.S. imports; (2) that oil export embargoes have been ineffective in advancing the foreign policy goals of oil exporters; (3) that oil export revenues have enhanced the ability of rogue states, such as Iran and Venezuela to pursue policies contrary to U.S. interests; (4) that terrorist attacks cost so little to perpetuate that attempting to curtail terrorism financing through measures affecting the oil market will not be effective, and (5) that the U.S. might be able to save an amount equal to between 12 and 15 percent of the fiscal defense budget if all concerns for securing oil from the Persian Gulf were to disappear." (Rand, 2009)

On 23 June 2005, Securing America's Future Energy in conjunction with the National Commission on Energy Policy developed an oil supply disruption scenario "Oil Shockwave" exercise to "evaluate security and economic consequences of an oil supply disruption." It involved a group of high profile former White House Cabinet and senior national security officials including the current Secretary of Defense, the Honorable Robert M. Gates. The premise of the exercise was to "examine the implications of a global oil shortfall and to explore possible response to and protections against such a crisis." (Robert Gates) The scenario, reflecting real world conditions and events, focused on worldwide oil supply and production disruptions and examined three potential hazards of oil disruption: Geopolitical instability, oil infrastructure vulnerability, and national

policy recommendations. The scenario revealed that as little as a 4 percent removal of global oil supplies caused a 177 percent increase in oil prices and sent the U.S. economy into recession. “The real lesson here [is that] it only requires a relatively small amount of oil to be taken out of the system to have huge economic and security implications.” (Robert M. Gates, Oil Shockwave National Security Advisor.)

In his 2003 book, *The Party’s Over*, Richard Heinberg details a “banquet of consequences” in store for the U.S. due to a lack of oil access. Severe negative consequences are to be expected in virtually every realm of the American way of life: Energy crisis will easily and rapidly translate to economic crisis, transportation crisis, food and agriculture crisis, heating and cooling crisis, environmental crisis, public health crisis, information crisis, and political crisis (Heinberg 2003, 167-198).

With so much reliance on oil, it is important to identify the strategic challenges associated with U.S. oil supply shortfall. This risk is significant due to the U.S. importing approximately 60 percent of the oil that it consumes. Oil supply disruption caused by oil industry infrastructure shortcomings, natural disasters, terrorism, and political strife, during any stage of oil production and processing, have negative consequences for the U.S. economy. High global energy demand and tight supplies exacerbate the problem of any supply disruption, sending energy prices exponentially higher and creating negative second and third order effects for the U.S. and world economy as well. As a result, it is important to examine potential oil supply disruption points individually to understand the gravity of the effect they have on the national security situation.

Oil Production and Processing Infrastructure and Practices

Access to all the crude oil in the world has little use until it is converted into useable forms of energy. Crude oil is virtually useless to consumers and industry without being refined into gas, diesel, kerosene, oils, lubricants, home heating oil, fertilizer, liquefied petroleum gas, plastics, nylon, polyester, petro-chemicals, and other petroleum by- products. A critical part of oil processing infrastructure is oil refining. Domestically, refineries are often the “choke point” in converting crude into useable energy in the form of refined products. All U.S. refineries are over 30 years old, the newest built in 1976. This presents a challenge to keeping up with production demand for refined products while maintaining and upgrading aging mechanical equipment. Production disruptions are expected to be less than 5 percent during scheduled maintenance periods. Currently, U.S. oil refining capacity tops 17 million barrels per day; there are a total of 150 oil refineries in the U.S., of which 146 are operational (U.S. Energy Information Agency).

Even though the number of refineries continues to fall, production output continues to increase. Continuous operation at peak capacity places strain on the aging infrastructure, making it susceptible to mechanical breakdown. With only 146 operational refineries in the U.S., even one refinery going off line can create severe consequences (U.S. Energy Information Agency).

New refineries are not being built for several reasons including the cost of more that $300 million to build one and stringent Environmental Protection Agency regulations. It is estimated, to keep up with annual refined product demand increases, an additional capacity of 250,000 barrels per day of capacity would be needed (MSNBC).

Currently, domestic refining shortfalls are being made up from imports from Venezuela, the Caribbean and Europe (MSNBC).

A prime example of the negative effects created from oil infrastructure negligence resulting in national environmental crisis and impending economic crisis for Gulf region of the U.S. is unfolding in the Gulf of Mexico as this study is being conducted. Secretary of Homeland Defense the Honorable Janet Napolitano called what could be the largest oil spill in U.S. history, a spill of “national significance.” In the early morning hours of 20 April 2010, the British Petroleum (BP) oil rig “Deepwater Horizon,” situated approximately 40 miles off Louisiana’s coast in the Gulf of Mexico exploded and sank two days later. Eleven crew members identified as missing are presumed dead. Initially, indications of oil sheen on the water around the wreckage were thought to have been caused by small amounts of residual oil leaking from the rig in the aftermath of the explosion. As oil continued to leak from the wreckage site, it was determined that the well head to which the oil rig was attached is leaking. Initial estimates determined that approximately 1,000 barrels of oil per day were leaking from the site. As of 30 April, estimates were that 200,000 gallons of oil per day were leaking. The U.S. Coast Guard estimates that 1.6 million gallons of oil had leaked from the oil well site located more than 5,000 feet below the Gulf’s surface since 20 April. Ian R. MacDonald, an oceanography professor at Florida State University, estimated the spill to be much larger. Based on Coast Guard charts and satellite imagery, he estimated the spill to be in the order of eight to nine million gallons of oil as of 28 April. Environmental experts say that environmental damage to wildlife and estuaries could exist for over 30 years.

In addition to the environmental catastrophe impact posed by the oil spill, the Gulf of Mexico's economy may be decimated as well. Louisiana's $2.5 billion commercial fishing and seafood industry supplies most of the U.S. with domestic shrimp and shellfish, has been jeopardized by the spill; one out of every 17 jobs in Louisiana is connected to the fishing industry. Alabama's $2 billion a year tourism industry is beginning to show the effects of the oil spill. This incident highlights the vulnerability of oil infrastructure and how far-reaching the consequences are. Terrorists could draw from this disaster and exploit key oil production infrastructure.

The controls that may be used in mitigating risk to oil infrastructure incorporate education controls, physical controls, and elimination controls. Education controls would be used by the USG to inform the petroleum production industry where they fit in the strategic level of national security of the potential crisis associated with damaged or non-operational facilities, and a more predictable "surge cycle." Physical controls would be modernizing the entire infrastructure on a rotational life cycle basis so that no infrastructure exceeds its maximum usefulness. Elimination controls would be to take the threat of aging infrastructure out of the problem by replacing them with new facilities.

Natural Disasters

Natural disasters are a very real threat to oil production and distribution operations. In 2005, Hurricane Katrina highlighted key energy infrastructure vulnerability to natural occurrences by incapacitating 92 percent of the Gulf Coast region's oil production, including at least eight Gulf region refineries, accounting for 10 percent of the region's production, which comprises 25 percent of U.S. total domestic production. Of the estimated 2900 oil platforms in the Gulf of Mexico, 109 oil platforms and five

drilling rigs were damaged or destroyed by Hurricanes Katrina and Rita. Additionally, the Gulf suffered severe environmental damage due to the Coast Guard's estimate of over seven million gallons of oil spillage from storage depots and other facilities (Stanford University).

Hurricane Katrina gave the U.S. a small glimpse of oil supply disruption challenges that may be a harbinger of the more serious scenarios to come. Many of the "Cassandras" believe that Hurricane Katrina highlighted the effects of peak oil and tight global energy supplies and that disruption of this magnitude and worse could be possible in the future. The oil production capabilities lost in the aftermath of Hurricane Katrina were felt immediately by the American public. Gas prices doubled to over $3 per gallon, gas shortages were experienced at some gas stations, and even price gouging occurred. All facets of American lifestyle were affected. Reported airline revenue losses due to fuel increase were estimated to reach $6 billion, public transportation systems were faced with fare increase and possible employee layoffs to offset the $750 million increase in fuel costs, record high vehicle purchases in July 2005 bottomed out in August 2005, with domestic automakers reporting their lowest shares ever in October 2005 (Securing America's Energy). (The U.S. auto industry has just last year begun to show a turn around). U.S consumer confidence suffered its greatest monthly drop in over a decade, and the growth of U.S. Gross Domestic Product during fourth quarter 2005 was 1.8 percent, compared to an average 3.4 percent the previous quarters. All of these situations were caused by fear the oil price shocks created (Securing America's future).

The controls that could be used to mitigate natural disaster hazards are physical. Education and elimination are not feasible, for example in the case of the Gulf of Mexico

oil production. It is a well known fact that hurricanes occur in that area and precautions are taken accordingly. But, since that region produces most of the U.S. domestic oil and hurricanes cannot be controlled, elimination of the risk is impossible. The most useful control that could be used would be to physically protect the existing oil infrastructure by developing better built rigs and platforms, and possibly moving the more vulnerable structures inland.

Terrorism

Recognizing the strategic importance of oil to the U.S., oil supply vulnerability can and has been targeted by extremist groups in an attempt to disrupt oil supplies. There are four critical stages that all oil must pass from well to consumer, each with their own unique vulnerabilities and security challenges that must be understood in order to protect them from terrorist attacks: (Goslin 2008).

First, are the oil wells and platforms. Well heads are comprised of a series of complex valve assemblies which are used to pump oil from the ground. Usually, these wellheads are located in remote regions that make them susceptible to sabotage by damaging or disabling any of the pumping mechanisms and rendering them inoperable. Similarly, oil platforms are essentially wellheads in bodies of water such as the Gulf of Mexico and the Atlantic Ocean where they are vulnerable to water and aerial terrorist attack (Mammoth Resource Partners, Inc.)

The next critical stage in oil production is the transportation of raw crude oil for processing. Oil is transported from wells to storage areas primarily either through pipeline networks or by tanker ships, both of which are highly susceptible to terrorist attacks. The U.S. oil production industry is connected by a vast pipeline network, much

of which is exposed above ground. Domestically, the 800 mile-long Alyeska Pipeline, which transports nearly one million barrels of oil per day oil from Alaska's North Slope to Valdez for shipping and provides most of the oil to the Western U.S. is highly vulnerable to terrorist attack. Although to date there have been no attacks on the miles of exposed pipeline, its remoteness and its importance to the U.S. make it an excellent target for terrorist attack. Saudi Arabia's 10,000 miles of mostly exposed oil pipelines, the Suez regions' Sumed Pipeline that transports two million barrels of oil per day, and the Caspian Sea's Baku-Tbilisi-Ceyhan pipeline are vulnerable to terrorist attack and would create significant shortages of oil worldwide if disabled (Mammoth Resource Partners, Inc.).

Just as vulnerable to terrorist attack are the oil tankers and their sea routes used to transport oil to refineries. Operating alone and unarmed over vast miles of global waterways, oil tankers are susceptible to water and aerial attacks, hijackings, and pirating. Somali pirates threatened to blow up the Korean oil tanker Samho Dream unless a ransom of $2 million was paid. The Samho Dream was hi-jacked in the early morning hours of 4 April 2010, carrying 2 million barrels of oil.

There are four major vulnerable sea lift routes assessed as strategic "choke points," which if closed would create significant problems (Mammoth Resource Partners, Inc.).

The Strait of Hormuz is the most critical and strategically vulnerable oil shipping lane in the world. It provides the only open sea access to the entire Persian Gulf region. Eighty percent of Persian Gulf oil, constituting 40 percent of the world's oil production passes through this waterway. Its proximity to the unstable Middle East makes it a prime

target for terrorist attack. A successful terrorist attack on the Strait of Hormuz would have serious economic and psychological repercussions worldwide. For this shipping lane to be rendered inoperable for any amount of time would have severe ramifications, effectively taking 40 percent of the world's oil off the market. Economic consequences would be far reaching and severe (Mammoth Resource Partners, Inc.).

The Bosporus Straits is the busiest waterway in the world with a ship transiting through it every 10 minutes. Over 50,000 ships transit the Bosporus Straits annually; of those ships, six thousand are oil tankers. Shipping traffic is only expected to increase in the future due to an increase in crude oil exports from the Caspian Sea region. The Straits are susceptible to sabotage and terrorist attacks and are known to be tricky to navigate, with cumbersome course direction changes, some of which are greater than 45 degrees. At its narrowest point, the straits are only 700 feet wide. These characteristics make it easy to mine the navigable channels, launch shoreline attacks and alter navigation aids. Some predict that an extended closure of the Bosporus Straits could remove 525 million barrels of crude oil from the Caspian Sea annually from the world oil market (Mammoth Resource Partners, Inc.).

Bab Al-Mandab and the Suez Canal are the primary routes by which Middle Eastern oil reaches Europe. Approximately two million barrels of oil pass these two points every day. Both points are vulnerable to terrorist attack primarily due to their proximity to radical Islamic hotbeds of activity. Although closure of these gateways would be devastating, in the event these routes were unusable, a lengthier, more expensive route around the Cape of Good Hope could be used (Mammoth Resource Partners, Inc.).

The Malacca Strait, the world's second busiest sea lane, is the primary route of Middle Eastern oil to China and the Far East. At 500 miles long, it passes through the territorial waters of several countries including Indonesia where there have been recent radical Islamic activities. Although not as critical to world oil transportation due to an a three day longer alternate route around the strait, its location in a potentially unstable region could hamper shipping operations and increase the global price of oil (Mammoth Resource Partners, Inc.).

The third critical stage in oil production is the bottleneck at ports, terminals and storage facilities. Shipping terminals and oil storage facilities are vulnerable to terrorist attack due to their lack of security. Arguably one of the most strategically vulnerable oil facilities in the world is Saudi Arabia's Ras Tanura oil complex. Saudi Arabia's main oil export terminal, 80 percent of all Saudi Arabian oil exports ship from this facility. Oil from Ghawar, the Saudi's largest oil field is pumped directly to Ras Tanura; no other alternate facility exists. Effectively destroying or disabling Ras Tanura would render Saudi Arabia's largest oil field inaccessible. It is estimated that one aircraft could render Ras Tanura completely inoperative. The length of time to repair large scale damages would be years. This would cause severe economic hardships around the world (Mammoth Resource Partners, Inc.).

The last stage of crude oil production is the processing at refineries. With only 146 out of a total of 150 oil refineries operational in the U.S., oil refineries are one of the most vulnerable chokepoints in the oil production process. As mentioned earlier, U.S. refineries are running at near full capacity to meet current demand, with projected demand to increase significantly. The damage or destruction of just one refinery could

result in the loss of refining capacity from two thousand to 573 thousand barrels of oil per day (U.S. EIA).

All three types of controls could be used concerning oil terrorism. Education could be used to inform the oil industry of the strategic importance of securing oil production infrastructure and thereby creating policies and procedures to mitigate those risks. A national and global short term oil shortage response plan should be considered to avert crisis. Both domestic and foreign oil production infrastructure is vulnerable to terrorist attack. Physical controls such as a standardized level of security worldwide would help ensure oil supplies are protected

Politics and Economics

The oil crisis of 1973 served as a prime example of how much power the oil producing countries wield politically and economically and how much the two are inextricably connected. In October of 1973, OPEC stopped oil exports to the U.S. and the west to "punish" the U.S. and western nations for supporting Israel. Overnight, the effects were felt by consumers all over America. Oil prices quadrupled and gasoline prices rose from 25 cents per gallon to over a dollar per gallon. Americans altered their way of life to adjust to the increased cost of goods and especially energy by implementing conservation efforts, many of which are still around today such as 55 Miles per hour speed limits and vehicle fuel mileage standards. The oil embargo of 1973 exposed U.S. vulnerability to foreign oil and the political regimes that control it (Institute for the Analysis of Global Security).

The 1973 oil embargo is similar to the current situation regarding the precarious position of the U.S. concerning securing its energy needs; it was recovering from an

economic recession and relied heavily on imported oil. Today, some clear parallels can be drawn to the current state of affairs concerning energy security; the U.S. is recovering from the most severe economic down turn since the Great Depression, and still relies heavily on imported oil. The 1973 oil embargo was eventually resolved diplomatically and lasted only slightly longer than a year. It is plausible that the next oil shortage could be much more severe and may be due to a number of issues including peak oil or possibly regime change in Saudi Arabia.

The U.S. has enjoyed an amicable relationship with the ruling Saudi Royal Family for more than 70 years. During these years, Saudi Arabia has remained a close ally to the U.S. in the Middle East. The fundamental issues of U.S. support to Israel and radical Islam, although a minority's view of the region, continues to undermine and strain U.S.–Middle Eastern diplomatic efforts. Regional tension and conflicts make regime change in Saudi Arabia a possibility. From a strategic standpoint, this scenario would be devastating to the U.S. Saudi Arabia, the Middle East's and the world's largest producer of oil is the anchor that underpins oil production and price stability. If a regime change occurred, it is conceivable that oil exports would be immediately cut or more costly to the U.S. and its Western allies. Although unlikely, this scenario cannot be discounted (Council on Foreign Relations).

In his U.S. Army War College Monograph, LTC Joseph E. Czarnik contends that oil is the "new weapon of mass disruption" that can be manipulated by both the exporter and the importer to gain a position of power. The exporter can use it to cripple economies by reducing or cutting exports thus dramatically increasing world prices and importers can use it as a weapon by significantly reducing demand through conservation efforts,

thereby importing far less oil and weakening the economic system of the exporter. This theory is flawed, however, for two main reasons. First, the U.S. imports approximately 60 percent of its oil. No current conservation programs could dramatically reduce the need for imported oil. Secondly, with the expansion of the global economy comes an increase in global demand; if the U.S. does not buy it, China will. Oil supplies are tighter than they have ever been. Saudi Arabia, the world's largest oil producer and country most able to exceed normal daily oil production, is capable of producing roughly four million barrels a day of spare capacity, which according to Khalid Al Falih, Chief Executive Officer of Saudi Arabian Oil Company could easily be absorbed into the market after the recession, due to growing demand (Bloomberg et al. 2010).

Probably the two most critical controls that could be instituted concerning oil politics would be education and elimination. First, it would be necessary to garner buy-in from the American public that reliance on foreign oil is bad for the country and that America needs to wean its self off of it. This will require a certain degree of sacrifice of individuals for the common good of the country in the form of higher gas prices and consumer goods. Once the U.S. reduces its overall demand for foreign oil thus reducing reliance on imported oil, the U.S. would be in a better position to develop and implement foreign policy. Reducing U.S. oil demand could eventually lead to foreign oil elimination. The USG would have to finance the conversion from oil to renewable energy (King 2010).

Global Competition for Oil

As the demand for oil increases, so does the competition to secure ample supplies. Currently, the U.S. is the world's largest consumer of oil. However, in the next two

decades, it is estimated that China will surpass the U.S. in oil consumption. China accounts for one-third of the increased global demand for oil experience in the last three years. China became a net oil importer in 1993 and today is the third largest importer in the world, behind only the U.S. and Japan. Half of the over seven and a half million barrels of oil consumed per day is imported; half of that is imported from the Middle East. China consumed 2.7 billion barrels of crude oil in 2008; a 5.8 percent increase over the previous year. Rising at a faster pace was China's consumption of refined petroleum products. Refined oil product consumption rose by 11 percent in 2008 to over 1.6 billion barrels (Xinhua et al. 2009). Projections have China's annual oil consumption doubling by 2025, to over 14 million barrels per day, of which more than 10 million barrels per day would be imported (*Washington Times*).

What is driving China's insatiable appetite for oil is a cycle of its growing industrial base fueling its Gross Domestic Product output, which is increasing per capita income and enables China's middle class to enjoy a higher quality of life. This drives consumerism and increase energy consumption per capita. Chinese consumer buying power is increasing and allows the middle class to buy goods, especially cars. Cars are rapidly replacing bicycles and scooters as the primary mode of transportation in China and 86 percent of oil consumed in China is used in the transportation sector (Bloomberg). More cars on the road means more oil is needed to power those cars. China's entry into the World Trade Organization in 2001 accelerated China's industrial base production. This holds true for China's automobile industry as well. In 2009, China became the world's largest automobile manufacturer, building nearly 14 million units. Most of the automobiles manufactured in China are sold in China.

To meet its demand for oil, China is engaged in an aggressive global hunt to secure its sources of energy. In addition to receiving imports from the Middle East, China has oil agreements in place with, Iran, Sudan, Burma, Venezuela and most recently Russia. Furthermore, China is engaging energy producers that have traditionally, almost exclusively, supplied oil to the U.S., specifically Canada. In 2005, China signed three agreements with Canada to gain access to Alberta's oil sands and join a pipeline project to transport oil to the Pacific coast for export to China (San Francisco Chronicle).

China's aggressive pursuit of oil has raised energy security concerns in Asia. Smaller countries such as Singapore and Vietnam are worried that China's dominance in the region could pose security issues for contested or disputed areas of oil discovery. Some analysts contend that the U.S. and China are on a collision course over resource competition. As mentioned in chapter 1, the current resource competition for oil can be likened to a West verses East effort to build coalitions and forge alliances in securing access to oil supplies. This could create a friction point between the U.S. and China, especially since China openly seeks trade relations with nations with whom the U.S. is at odds including Iran and Venezuela. Another potential U.S.-China flashpoint is on the continent of Africa (Institute for the Analysis of Global Security). In 2004, approximately 29 percent of China's oil imports were from Africa. Currently, China is vigorously pursuing energy initiatives in more than a dozen African countries (Ghazvinian, 276).

Oil and Terrorism: The Connection

The U.S. is caught in a paradoxical dilemma over its dependence of foreign oil: In 2008, the U.S. imported nearly $354 billion dollars on imported foreign oil. DOD consumes one percent of the total oil consumed by the U.S. to fuel the wars on terror in

Iraq and Afghanistan. Much of that oil comes from the Middle East, more specifically, Saudi Arabia. The paradox of the situation is that a portion of the money that the U.S. spends on oil from Saudi Arabia is actually supporting Al Qaeda's war efforts against the U.S.

Here's how it works:

Saudi Arabia for example is a rentier state, with its citizens paid an endowment from proceeds of oil revenues. As such, they do not pay income tax. Instead, in accordance with Islam, they donate 2.5 percent of their income to charity. This offering is known as the Zakat. The Zakat is intended to be donated to charities to benefit the less fortunate in Islamic society and the majority of donations are well intended. However, in the Muslim community there are money laundering rackets designed to channel proceeds of the Zakat to fund Al Qaeda and other radical Islamic groups. One of the practices that facilitate money laundering in Arab society is the practice known as the Hawala, a method of verbal monetary transactions with no written record keeping system. This system makes it extremely difficult to track transactions and know exactly where monies were transferred (Institute for the Analysis of Global Security).

Petrodollars are also used to fund Madrassas, Islamic religious schools. During the Afghan-Soviet War from 1979-1989, Saudi Arabia financed Madrassas around the world, especially in Afghanistan. Many Taliban and Northern Alliance were educated in Saudi financed Madrassas under the strict Wahhabism form of Islam rooted in Saudi Arabia. During this period, the teachings in the Madrassas were not scholarly based but geared toward religious fervor and hatred of the Soviet infidels. Now the hatred taught in many of these schools is directed at the U.S. (Frontline).

Iran, OPEC's second largest producer of oil is suspected of funding radical Shiite Muslim organizations and Hezbollah of Lebanon. Some experts contend that Iran's petrodollars make it untouchable on the geo-political scene, allowing it to defy United Nations sanctions and continue its nuclear program. Despite U.S. trade sanctions, in 2008 Iran exported two and a half million barrels of oil per day. Japan and China were the top importers of Iranian crude. Iran is reliant on petrodollars; 50 percent of its Gross Domestic Product is comprised of oil revenue. However, Iran knows the power of oil and has used it to gain leverage in the geo-political realm. Iran understands that their oil can be used as an economic weapon against the U.S. and the West. If Iran were to remove their two and a half million barrels of oil per day from the global market, the consequences would be severe.

The Cost of Imported Oil

The cost of foreign imported oil is high in terms of national economic security. "Oil price shocks and price manipulation by OPEC have cost our economy dearly--about $1.9 trillion from 2004 to 2008--and each major shock was followed by a recession" (www.fueleconomy.gov). In 2008 the U. S. imported nearly $354 billion worth of oil. In July of 2008, oil broke a record high when it was traded at $147.27 a barrel on the stock exchange. As U.S. reliance on imported oil continues to grow, so does its economic vulnerability. As mentioned previously in this chapter, the economic risk associated with loss of oil access is the most probable and most dangerous to the U.S. This problem is exacerbated by supply and demand; when global oil demand increases, global competition for that oil increases, which in turns raises the price of oil which could

ultimately lead to supply disruptions. As shown, more demand with less capacity creates volatility in assuring stable access to oil.

High imported oil costs were not the single source of the global recession, but they certainly may have contributed to it. The International Energy Agency suggests the rapid increase in price of crude oil from 2003 to 2008 played an important, “albeit, secondary” role in the recession. High oil prices stunt economic growth. The doubling of oil prices from 2003 to 2005 lowered global economic output by 1.5 percent or $750 billion (Rogoff 2005). Richard Heinberg makes an interesting argument for the effects of oil dependency on the economy through physical and financial terms. His premise maintains that the U.S. financial system was built upon constant growth derived form ample available energy sources (oil) with the assumption that growth was “inevitable and desirable.” A key concept and component of the American financial institution is based on compound interest, where money is created from loans and represents debt. The money to repay loans is generated from production growth and productivity. If production growth and productivity are stifled due to exorbitant prices of energy (oil), fewer goods will be produced, less consumption of those goods will occur, and loans cannot be re-paid. In this case, new loans must be taken out to re-pay old loans. If there are more loans out than the rate of economic production or growth and consumption, inflation will occur. More businesses taking out fewer loans due to lower demand could initiate a vicious economic tailspin resulting in an economic implosion all due to a net energy decline.

Catherine Gautier illustrates the disparity between oil exporting and oil importing countries and the economy. Five main OPEC countries have 95 percent of their

economies tied to oil industries as opposed to 17 percent in the U.S. The price of a barrel of oil directly affects the economies of the U.S. and oil producing countries inversely. As an example, for Saudi Arabia, a one dollar increase in the price of a barrel of oil translates to additional Saudi Arabian revenue of $3.4 billion. Conversely, for the U.S. which imports 10 million barrels of oil per day, that same one dollar increase in the price of a barrel of oil translates into an additional $4 billion increase in the cost of oil imports.

As mentioned previously, there are several ways to address and mitigate U.S. oil dependency; conservation, oil source diversification, fossil fuel diversification, and alternative energy sources.

Conservation: In the last five years, there has been a significant resurgence in oil conservation, especially in the automotive sector. U.S. motor fuels consumption accounts for 11 percent of global oil consumption. After record high oil prices, thus gas prices experienced in 2008 shocked U.S. motorists into a conservation mindset, new technologies in the automotive industry including flex-fuel, clean burning diesel, hybrid, and electric are enjoying a surge in popularity and demand. Stringent government fuel economy standards have increased for the first time in 25 years. 2011 model year automobiles miles per gallon rating standards have increased by 8 percent from 2010 standards to 27.3 miles per gallon. Passenger vehicles miles per gallon are at 30.2 and light trucks 24.1 miles per gallon. The increased fuel economy standards which are expected to be implemented in September 2010 will reportedly save 887 million gallons of fuel.

Oil source diversification: In 2008, the top three exporters of crude to the U.S. are Canada at 1.9 million barrels a day, Saudi Arabia at 1.5 million barrels a day, and Mexico

at 1.2 million barrels a day. Imports from OPEC topped 5.4 million barrels a day, with 2.3 million barrels coming from the Middle East (U.S. Energy Information Agency). At current production rates, the world's "proven," 1.3 trillion barrel reserves, of which 83 percent will be controlled by Middle Eastern countries by 2020 would last 80 years, compared to 15 years of the non Arab producers which control 17 percent of the proven reserves (Institute for the Analysis of Global Security).

As global competition for oil increases resulting from global demand, the race is on to find access to ample stable oil supplies around the world. Both the 2002 and 2006 U.S. National Security Strategies recognize that the diversification of suppliers is vital to energy security. Expansion in the Western Hemisphere, Africa, Central Asia, and the Caspian region are seen as viable energy sources in the future.

The Western Hemisphere's top oil producers, the U.S., Canada, and Mexico are also the most stable producers in terms of supply assurance. However, at current consumption rates the U.S. must diversify its oil portfolio to ensure access to the resource. At approximately 8 million barrels per day, (U.S. Energy Information Agency) the U.S. is the third largest producer of oil in the world, although U.S. oil production peaked in 1970 and has been in decline ever since. The U.S. has estimated oil reserves of nearly 21 billion barrels (U.S. Energy Information Agency). Domestically, there have been no significant oil discoveries since the 1930s , although there is much debate over the highly contested region of the Alaska National Wildlife Refuge. Many cursory estimates by the U.S. Department of the Interior place oil reserves in the Alaska National Wildlife Refuge at over 9 billion barrels. Due to political and environmental considerations, there has not been significant study and development of the region.

However, the Alaska National Wildlife Refuge still may be the U.S.'s last significant oil reserve to ease the vulnerability of foreign oil. Canada, the U.S.'s primary supplier of oil has a proved reserve of nearly 180 billion barrels, although a significant amount in non-conventional oil in the form or oil sands. Estimates range that there is 100 years worth of oil reserves at current production rates. Mexico, the U.S.'s third largest exporter has oil reserves estimated at 14 billion barrels. Alarmingly, experts contend that Mexico may well reach peak production within the next 10 years and become one of the top oil importers in the world. This scenario would have serious implications for the U.S.

Africa holds promise as a source of energy for the U.S. Recently, there has been much oil exploration on the African Continent with tangible results. Nigeria continues to lead African oil production at over 2 million barrels per day with estimated oil reserves at over 36 billion barrels (U.S. Energy Information Agency). Algeria, Angola, Sudan, and Equatorial Guinea hold promise as major suppliers as well. Competition for Africa's oil may grow intense in the coming years, as China has been investing heavily on the continent in an effort to "lock up" energy supplies. This could ignite conflict and be seen by the U.S. as Chinese aggression, creating tension not only in the region, but globally as well.

The Caspian Sea region promises to ease the tight oil supplies by bringing Caspian oil on the market via the Baku-Tblisi-Cheyan pipeline constructed in 2008. This would be another source from which the U.S. could draw from to supplement its oil deficit. However, Russia has shown opposition to western access from the contested region and in 2008 invaded Georgia in a show of force, seizing key oil and energy infrastructure.

Energy independence is the key for the U.S. to ensure its national security. Reliance on foreign oil forces the U.S. to negotiate with unsavory regimes and world leaders that do not share the same interests and goals as the U.S. In 2008, the U.S. imported oil from 10 countries that are on the State Department's travel warning list. Competition for the world's oil will only continue to become more competitive, intense and conflicting as supplies dwindle.

Fossil Fuel Diversification: Although all fossil fuels will presumably follow a peak and decline pattern similar to oil, and are not a permanent solution to oil independence, it is noteworthy to mention them as a resource to extend the life of oil. Coal and natural gas could be relied on more heavily to bridge the energy security gap to lessen U.S. oil dependence.

Due to record high oil prices, unconventional oil technology that has been in existence for years is just becoming economically viable to extract oil from unconventional methods commonly referred to as oil shale or oil sands. This technique extracts oil by heating oil rich substrate to extremely high temperatures and separating the oil. Although there are substantial reserves of oil sands in North America, oil shale refining is extremely damaging to the environment, expensive, and yields lower grade oil.

Coal is the most abundant fossil fuel in the U.S. The EIA estimates that the U.S. has coal reserves of approximately 275 billion short tons, almost a quarter of the total world's reserves. In 2008, the U.S. produced over one billion short tons of coal, 90 percent of which was consumed to produce electricity. In 2008, coal generated 48 percent of the U.S. 4.1 trillion kilowatt-hours consumed in the U.S. Although cheap and abundant, coal accounts for 93 percent of sulfur oxide, 80 percent of nitrogen oxide and

73 percent of carbon dioxide generated by electricity plants. Since a great deal of the oil consumed in the U.S. is in the form of motor fuels, coal would not be a viable solution to oil; although, the technology does exist where oil can be produced from coal, it has not been fully developed as of yet.

Natural gas, another fossil fuel widely used in industrial countries, is a promising fuel to temporarily ease the strain of oil. Currently in the U.S., natural gas accounts for one-quarter of the total energy consumed and is used for home heating, cooking, and electricity generation. Natural gas can also power motor vehicles when burned in internal combustion engines that have been converted to do so. Natural gas initially looks promising as a potential replacement for oil in the near term; cleaner burning, versatile, and energy rich. But, just as oil peaked and declined, so too will natural gas.

Alternative Energy Sources

One way to extend the life of domestic oil and wean the U.S. off imported oil would be to expand existing energy technologies. Although nuclear, wind, solar, biomass, geothermal, and hydro technologies have been harnessed and are currently economically viable, more emphasis should be placed on the further development and implementation of these technologies in the future. With the exception of nuclear power, all the alternative energy sources listed above are renewable energy sources.

Summary

U.S. dependence on oil creates national security risk. Non-access to secure and uninterrupted oil supplies is the most significant hazard created by U.S. dependence on imported oil. All indications are that the future will be an era of persistent conflict from

hybrid threats marked with resource competition from state and non-state actors. Oil's economic and political leverage can be used as a weapon against the U.S. It is essential that the U.S. adopt a comprehensive strategy to reduce its vulnerability to oil while simultaneously mitigating the hazards to oil access including oil infrastructure, natural disasters, terrorism, and global competition.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Introduction

Oil and energy security concerns have come to the forefront of national and economic security. Resource access and procurement is seen as a vital component of national security and foreign policy strategies not just for the U.S., but for all industrialized nations as well. This study set out to answer the questions “How does U.S. dependence on oil create national security vulnerability: what risks are associated with America’s dependence on oil: and how can the U.S. mitigate those risks?

This study sought to determine what realm of U.S. national security was impacted by oil dependence. It is hard to believe that the U.S., the most powerful nation in the entire world could have any vulnerability, yet the Rand study showed quite clearly that the country is really only one oil supply disruption away from chaos.

The findings of this study revealed that U.S. vulnerability to dependence on oil manifests in the realm of national homeland security, economic security, environmental security, and geo-political security, with economic security posing the greatest security vulnerability. Since the U.S. economy is driven by oil, it is a matter of national security that the U.S. maintains a safe, reliable, and ample supply of oil. As global competition increases for oil, securing those supplies will become more difficult.

Summary

Risk to U.S. national homeland security, defense security, economic security, environmental security, and geo-political security are all associated with dependence on

oil. To define how oil dependence is a risk to these security variables, it is important to remember that America's super power status was built on oil. The industrial revolution and the world's largest Gross Domestic Product were fueled by access to cheap, plentiful energy; coal then oil. World-leading manufacturing and exporting continued through the mid to late 1970s , when the full effects of domestic peak oil were realized and access to cheap, plentiful oil was declining. Then too did America's industrial engine begin to decline. This ushered in the era of foreign oil reliance which has increased nearly every year since and is where the U.S. stands today; dependent on foreign oil for national security, defense security, economic security, and geo-political security.

The U.S. can mitigate, manage, or better yet eliminate the risks associated with oil dependence through an oil independence strategy now on its own terms while it would be less painful, or be forced to down the road by oil cartels or global peak oil when it is very painful. The road ahead to oil independence will be a long and winding one. Eventually, the U.S. has no choice but to change its oil consumption patterns and rates, it simply must, oil is finite. The U.S. may never be completely oil independent. But, as oil becomes harder to extract and refine it will get more expensive. As global demand intensifies, it will get more expensive. There will come a "breaking" point where the price of oil will drive technology and innovation to develop and implement better alternatives. The U.S. was built on oil, and it is going to be hard to wean it of oil. There are several ways to approach this problem: conservation, oil source diversification, fuel diversification, and alternative energy sources are the key.

U.S. oil dependence is a very serious issue facing policy makers. It is clear that oil is a finite resource and that the U.S. cannot continue to depend on oil, especially imported

oil to maintain its world super power status. The most vulnerable aspect of national security to the U.S in regards to oil dependence is economic security risk due to lack of access to oil. Since the U.S. relies so heavily on imported oil, it is imperative that renewable alternative energy sources be developed and infrastructure created to facilitate the ushering in of a new generation of clean, renewable security, not just for the U.S., but for the world.

Recommendations

The first recommendation in reducing U.S. vulnerability to oil is for the USG to create a national cabinet level energy security task force to identify and study the synergistic effects of oil dependence, vulnerabilities of oil dependence, and solutions for oil dependence mitigation. The task force would take on the whole-of government approach and be comprised of members from the Departments of State, Energy, Defense, Homeland Defense, and Commerce. The product that would be produced from the energy task force would be a comprehensive energy security plan that identified the energy security problem, established measure of effectiveness, measure of performance, key indicators along the way, and an end state. The resultant product would be an executable plan that vetted through policy makers and directed at action agencies. A good example for a "road map" would the AESIS. Additionally, chapter 2 identified there is no national level energy supply disruption response plan. The energy security task force would be charged with developing an energy supply disruption plan as well.

As determined by this study, the greatest risk to U.S. national security from oil dependence is economic security from lack of oil access to oil supplies. The second recommendation would be to examine the hazards associated with impediments to oil

access analyzed in chapter 4 and develop a strategy to mitigate those hazards. The explosion of the oil rig Deepwater Horizon highlights the oil industry's infrastructure vulnerability and the great destruction that can be caused by one small piece of that infrastructure.

Areas for Further Research

The main areas of further research that would serve to mitigate the vulnerabilities and risks concerning U.S. oil dependence would be in the oil supply disruption prevention and critical infrastructure protection realm. The further research would be best served to study the impediments to oil access, specifically oil infrastructure and how to protect it from terrorism.

GLOSSARY

Al Qaeda. An Islamist group founded sometime between August 1988 and late 1989. It operates as a network comprising both a multinational, stateless arm and a fundamentalist Sunni movement calling for global jihad.

Alternative energy. Alternative energy is an umbrella term that refers to any source of usable energy intended to replace fuel sources without the undesired consequences of the replaced fuels.

Climate Change. In recent usage, especially in the context of environmental policy, climate change usually refers to changes in modern climate. It may be qualified as anthropogenic climate change, more generally known as "global warming" or "anthropogenic global warming" (AGW).

Global Warming. Global warming is the increase in the average temperature of Earth's near-surface air and oceans since the mid-20th century and its projected continuation.

Hurricane Katrina. Category 3 hurricane that struck the Gulf Coast region of the United States in 2005. Atlantic hurricane season was the costliest hurricane, as well as one of the five deadliest, in the history of the United States. Among recorded Atlantic hurricanes, it was the sixth strongest overall.

Madrassa. Muslim school, college or university that is often part of a mosque.

Northern Alliance. The United Islamic Front for the Salvation of Afghanistan (UIF, *Jabha-yi Muttahid-i Islami-yi Milli bara-yi Nijat-i Afghanistan*), more commonly known as the Northern Alliance, was a military-political umbrella organization created by the Islamic State of Afghanistan in 1996. The organization united various Afghan groups fighting against each other to fight the Taliban instead.

Oil crisis of 1973. The 1973 oil crisis started in October 1973, when the members of Organization of Arab Petroleum Exporting Countries or the OAPEC (consisting of the Arab members of OPEC, plus Egypt, Syria and Tunisia) proclaimed an oil embargo "in response to the U.S. decision to re-supply the Israeli military" during the Yom Kippur war; it lasted until March 1974.

Oil infrastructure. The equipment, facilities and practices used by the oil industry to produce, process and transport crude oil and refined petroleum products.

Oil reserves. Quantities of crude oil estimated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. To qualify as a reserve, they must be discovered, commercially recoverable, and still remaining.

Peak oil. The point in time when the maximum rate of global petroleum extraction is reached, after which the rate of production enters terminal decline. The concept is based on the observed production rates of individual oil wells, and the combined production rate of a field of related oil wells.

Terrorism. The systematic use of terror especially as a means of coercion.

Wahhbism. is a branch of Sunni Islam practiced by those who follow the teachings of Muhammad ibn Abd-al-Wahhab (1703–1792 C.E.), after whom the movement is named. Wahhabism is the dominant form of Sunni Islam found in Saudi Arabia, Kuwait, and Qatar, as well as some pockets of Somalia, Algeria, Palestine, and Mauritania.

REFERENCE LIST

2006. China's oil consumption. *Washington Times.* 19 April. http://www.washington times.com (accessed 5 May 2010).

Bittle, Scott and Jean Johnson. 2009. *Who turned the lights out?* New York: Harper Collins Publishers.

Bloomberg. 2010. Market can absorb spare capacity-Al Falih. (10 March). http://www.arabianbusiness.com/583355-market-to-absorb-spare-saudi-capacity (accessed 18 May 2010).

Collier, Robert. 2005. China on global hunt to quench its thirst for oil. *San Francisco Chronicle,* 26 June. http://articles.sfgate.com (accessed 5 May 2010).

Cory, Roger L. 2010. Oil terrorism: The living nightmare no one wants to contemplate. Mammoth Resource Partners, Inc. http://www.mammothresource.com (accessed 10 May 2010).

Council on Foreign Relations. 2010. Saudi Arabia: In al Qaeda's sights. http://www.cfr.org (accessed 10 May 2010).

Czarnik, Lieutenant Colonel Joseph E. 2007. U.S. oil dependency: The new weapon of mass disruption. Monograph, U.S. Army War College.

Deffeyes, Kenneth. 2001. *Hubbert's peak.* Princeton: Princeton University Press.

Department of Defense. 2008. *National defense strategy* (*NDS*). Washington, DC: Government Printing Office.

———. 2010. *Quadrennial defense review* (*QDR*). Washington, DC: Government Printing Office.

Department of the Army. 2009. *Army energy security implementation strategy* (AESIS). Washington, DC: Government Printing Office.

Gautier, Katherine. 2008. *Oil, water, and climate change: An introduction.* New York: Cambridge University Press.

Ghazvinian, John. 2007. *Untapped: The scramble for Africa's oil.* Orlando: Harcourt, Inc.

Goslin, Charles. 2008. White paper: International petroleum security systems. http://www.duostechnologies.com (accessed 18 May 2010).

Heinberg, Richard. 2003. *The party's over: Oil, war, and the fate of industrial societies.* Canada: New Society Publishers.

Institute for the Analysis of Global Security. 2010a. Fueling the dragon: China's race into the oil market. http://www.iags.org (accessed 10 May 2010).

———. 2010b. The future of oil. http://www.iags.org (accessed 10 May 2010).

———. 2010c. Fueling terror. http://www.iags.org (accessed 10 May 2010).

Natural Resourcs Defense Council. 2010. Safe, strong and secure reducing America's oil dependence: America's rising consumption of oil threatens the economy and national security. http://www.nrdc.org (accessed 10 May 2010).

PBS. 2010. Frontline: Analysis Madrassas. http://www.pbs.org (accessed 16 May 2010).

Rogoff, Kenneth. 2005. Oil and the global economy. Paper presented at the International Energy Forum Secretariat meeting of Ministers and Oil Company Presidents, 15 November 2005, in Riyadh, Saudi Arabia.

Schoes, John W. 2004. U.S. refiners stretch to meet demand: Can existing plants continue to squeeze more output? *MSNBC*. 22 November. http://www.msnbc.msn.com (accessed 18 May 2010).

Secureenergy.org. 2010. Securing America's future energy oil dependence: A threat to U.S. economic and national security. http://www.secureenergy.org (accessed 10 May 2010).

Sohbet Karbuz blog. 2006. Department of Defense energy policy. 2 July. http://karbuz.blogspot.com/ (accessed 10 May 2010).

———. 2008. The U.S. military energy consumption in 2008. http://karbuz.blog spot.com/ (accessed 10 May 2010).

Stanford University School of Earth Sciences. 2010. Homepage. http://pangea. stanford.edu/ (accessed 16 May 2010).

U.S. Energy Information Administation. 2010. Oil, crude and petroleum products explained. 26 January. http://tonto.eia.doe.gov (accessed 10 May 2010).

U.S. Senate. 2006. U.S. Senate Committee on Foreign Relations. Opening statement for hearing on oil dependence and economic risk. 30 March.

Warriors for Truth.com. 2010. Alaska oil drilling ANMR. http://warriorsfortruth.com (accessed 16 May 2010).

The White House. 2002. *National security strategy* (*NSS*). Washington, DC: Government Printing Office.

———. 2006. *National security strategy* (*NSS*). Washington, DC: Government Printing Office.

Xinhua. 2009. China’s oil consumption up 12 percent in 2008. *China Daily* (27 January).

INITIAL DISTRIBUTION LIST

Combined Arms Research Library
U.S. Army Command and General Staff College
250 Gibbon Ave.
Fort Leavenworth, KS 66027-2314

Defense Technical Information Center/OCA
825 John J. Kingman Rd., Suite 944
Fort Belvoir, VA 22060-6218

LTC Thomas R. Hoffman
Center for Army Tactics
USACGSC
100 Stimson Avenue
Fort Leavenworth, KS 66027-2301

Dr. Wendell C. King
Dean of Students
USACGSC
100 Stimson Avenue
Fort Leavenworth, KS 66027-2301

Mr. Robert M. Brown
Department of Joint, Interagency and Multinational Operations
USACGSC
100 Stimson Avenue
Fort Leavenworth, KS 66027-2301